World Nutrition Journal |eISSN 2580-7013

ORIGINAL PAPER

Factors associated with physical inactivity among community dwelling adults in Umuahia, Nigeria

Patricia Ogechi Ukegbu[1], Beulah Favour Ortutu[1], Precious Chinaza Uche[1], Andrew Ugwunna Ukegbu[2]

1. *Department of Human Nutrition and Dietetics, Michael Okpara University of Agriculture, Umudik, Abia State, Umuahia, Nigeria*
2. *Department of Community Medicine, Federal Medical Centre, Umuahia Abia State, Nigeria*

Received: 18 March 2022
Accepted: 6 June 2022
Published: 26 August 2022

Link to DOI: 10.25220/WNJ.V06.i1.0008

Citation: Ukegbu P O, Ortutu B F, Uche P C, Ukegbu A U. Factors associated with physical inactivity among community dwelling adults in Umuahia, Nigeria. World Nutrition Journal.2022 Aug 26, 6(2): 49-57

Website : http://www.worldnutrijournal.org/

Abstract

Background: Considerable evidence suggests that physical inactivity contributes to the magnitude of non-communicable diseases (NCDs) and is responsible for premature deaths globally.

Objective: This study aimed to examine physical inactivity and associated factors among community dwelling adults in Abia State, Nigeria.

Methods: A total of 868 community-dwelling adults (20 to 59 years) were sampled in a cross-sectional survey using multistage sampling technique. A validated questionnaire was used to collect information on sociodemographic and lifestyle characteristics. Weight and height were measured and used to calculate the body mass index (BMI). The Global Physical Activity Questionnaire (GPAQ) was used to collect data on physical activity status. Univariate and multivariate logistic regression were used to assess the relationship between physical inactivity and associated factors at $p<0.05$.

Results: The prevalence of physical inactivity was 49.8% (48.5% in males and 51.0% in females), while combined overweight and obesity was 39.4%. In the adjusted model, physical inactivity was associated with older age (OR=0.49, 95% CI: 0.34- 0.71), increasing BMI (OR=0.67, 95% CI: 0.49-0.91), increasing income (OR=0.65, 95% CI: 0.48- 0.89), and alcohol consumption (OR=0.67, 95% CI: 0.47- 0.97).

Conclusion: The high prevalence of physical inactivity among adults underscores the need for community-based physical activity interventions to reduce the burden of NCDs among adults.

Keywords: physical inactivity, prevalence, risk factors, community, adults

Introduction

Physical inactivity, is ranked as the fourth leading cause of death in low- and middle-income countries.[1] Considerable evidence suggests that physical inactivity is responsible for approximately 3.2 million (over 9%) premature deaths globally[1] and contributes to the magnitude of non-communicable diseases (NCDs). Globally, physical inactivity is reported to contribute to 21% of breast cancer, 27% of diabetes and 30% of ischemic heart diseases[2], with the World Health Organisation estimating about three million physical inactivity-related deaths in 2014 in Sub Saharan Africa.[3] In Nigeria 6.8% of adults older than 40 years are diabetic, 8.8% are obese[4] and 31% are hypertensive.[5] In addition, the increasing morbidity and premature mortality rate caused by physical inactivity is also responsible for substantial economic burden worldwide.[6]

Different tools have been used to measure physical activity status.[7] For instance, in population based surveys, it is necessary to use a valid instrument, which is relatively cheap and has easy application in order to allow for comparison among surveys conducted in different localities.[7]

Corresponding author:
Ukegbu PO (PhD)
Department of Human Nutrition and Dietetics, Michael Okpara University of Agriculture, Umudike Abia State, PMB 7267, Umuahia, Nigeria
E-mail: adanna2025@yahoo.com

The Global Physical Activity Questionnaire (GPAQ) or International Physical Activity Questionnaire (IPAQ) is a commonly used tool. These questionnaires were proposed by the World Health Organisation (WHO), with the objective of making available a tool for measuring physical activity levels, that could easily be adapted in different regions and culture.[7]

The WHO health report of 2000, indicated that 17.7% of the global population (aged 15 years and above) were not engaged in any kind of physical activity. The report also showed that nearly 58% of adults were not achieving the recommended number of moderate-intensity activities to be considered physically active.[8] As a result, WHO recommended that adults should engage in at least 150 minutes of moderate (MPA) to 75 minutes of vigorous physical activity (VPA) per week, respectively, or an equivalent combination of moderate to vigorous physical activity (MVPA) throughout the week.[9] This is equivalent to an energy expenditure of more than 600 Metabolic Equivalent of Task-minutes per week (MET-minutes per week) and is considered as sufficient physical activity, while less than 600 METS minutes per week is considered physically inactive.[9]

Globally, physical inactivity is reported to be prevalent in many countries.[1] For instance, the prevalence of physical inactivity was 79%, 56.2%, 43.7% and 43.3% in Saudi Arabia, China, Malaysia, and Nepal, respectively.[10,11] A high prevalence of physical inactivity has also been reported in African countries with 60.5%, 53.2%, and 31.4% in South Africa, Mali, and Nigeria, respectively[12], thus indicating the burden is on the increase in many countries.[1,12] The nutrition transition, accompanied by rapid urbanization, unhealthy diet, and changes in work patterns have contributed to physical inactivity particularly among adults in developing countries.[13] In addition, physical inactivity is reported to be associated with other risk factors such as age, place of residence, sex, body mass index, alcohol consumption, cigarette smoking, educational status and economic status.[13,14,15,16]

Nigeria is a low-middle income country undergoing rapid nutrition and epidemiologic transition.[12,16] It has an estimated population of over 200 million, which is the highest in Africa and perhaps includes the highest population of physically inactive persons on the continent.[17] The prevalence of physical inactivity is reported to be high in Nigeria, ranging from 25% to 57%, with this linked to a higher prevalence of obesity, type 2 diabetes and cancer.[4,18] In a systematic review and meta-analysis, it was estimated that about 50 million persons in Nigeria are physically inactivity on a weekly basis representing an age-adjusted prevalence of 58%. Comparison of physical inactivity levels across the geopolitical regions showed that the South-east zone had the highest prevalence (63.3%), compared with the South-west (40.8%) and South-south regions (57.7%).[17] However, most studies assessing physical inactivity focused on urban adults with limited information among community-dwelling adults in both urban and rural areas. Information from community dwelling adults will provide insights into targeted interventions that will help reduce the burden of NCDs among them. This study therefore assessed physical inactivity and associated factors among community dwelling adults in Umuahia South East, Nigeria.

Methods

Study design, population and sample size determination

The study was a community-based cross sectional survey with adult participants (men and women) aged 20 to 59 years recruited from communities in Umuahia North and Ikwuano Local Government Areas (LGA). Multistage probability sampling method was adopted to recruit normal residents of the selected communities. Adults who were disabled or too sick to walk and unable to communicate during the study period were excluded from the study. Sample size was estimated using the formular N/1 + N (*e*), where N represents the population size based on age distribution of the 2006 census report[20] and *e* represents level of precision (0.05) which amounted to 868, including a 10% drop-out rate.[2,19]

Data collection and measurement

Validated structured questionnaires were used to obtain information on socio-demographics. The global physical activity questionnaire (GPAQ) was used to collect data on physical activity levels (metabolic equivalent for tasks [METs] min/wk) through face-to-face interviews. Six trained research assistants were recruited and they explained study procedures and administered questionaires to the participants in the participant's preferred language (English or *Igbo*).

Socia-demographic characteristics

Socio-demographic and health information included: age, educational status, income, marital status house hold size, income, and occupation. Age was divided into two categories: ≤ 40 (reference group), and >40 years. Educational level was categorized as having no formal education (reference group) or being educated. Household size was classified as ≤3 (reference group) and >3. Income levels were divided into; <#30,000 (reference group), #30,000 to 100,000 and >#100,000. Occupation was categorized as employed (reference group) or not employed. Alcohol consumption and smoking status were also determined using Yes or No options.

Anthropometrics measurements

Anthropometric measurements were performed according to guidelines of the International Society of the Advancement of Kinanthropometry.[21] Body weight with minimal clothing was measured to the nearest 0.1kg using a calibrated digital scale and height was recorded to the nearest 0.1m using a stadiometer attached to the scale (Seca model 284, Hamburg, Germany). Body mass index (BMI) was calculated from height and weight measurements as body weight divided by square of height (weight/height (m^2) and classified as normal, overweight and obese using the WHO guidelines.[22]

Physical activity assessment

The Global Physical Activity Questionnaire (GPAQ) was used to obtain physical activity information through face-to-face interviews.[23] The questionnaire gathered information on PA performed in the previous 7 days in the following domains: work, travel-related and recreational physical activity. Physical activity level was measured using Metabolic Equivalents (METs)-minutes per week. of 8, 4 and 4, for vigorous, moderate and leisure time physical activity.[23] A dichotomous categorical variable was used to classify participants based on whether they were physically active (with MVPA ≥600 MET minutes/week) or inactive (MVPA <600 MET min/wk).[23]

Statistical analysis

Statistical analysis was performed using IBM® SPSS Statistics software, version 25. Descriptive statistics including frequency, percentage, mean, standard deviation were used to summarize socio-demographics. Univariate and Multivariate associations between physical inactivity and related factors were determined. Results were presented as in adjusted odds ratio (AOR) and 95% confidence interval (Cl), and a p-value of less than 0.05 was accepted as statistically significant.

Results

Characteristics of the participants (n=868)

Table 1 depicts the basic characteristics of the respondents. A total of 868 adults participated in the study. There was an almost equal proportion of males (49%) and females (51%). Most of the adults were married (57.5%), employed (80.3%), had more than 3 persons per household (74.5%), and earned a monthly income less than #30,000 (57.4%). Few adults reported smoking cigarettes (7.98%) and alcohol consumption (20.4%). Unemployment rate was 19.7%, most adults had completed secondary education and 60.6% had normal BMI.

Physical activity status of participants

The physical activity status is presented in Table 2. About half of the adults were physically active (50%), while 49% failed to meet the WHO recommended PA levels (inactive).

Table 1. Descriptive characteristics of the participants (n=868)

Variables	Male N (%)	Female N (%)	Total N (%)
Age			
<40 years	313 (73.6)	297 (67.0)	610 (70.3)
≥40 years	112 (26.4)	146 (33.0)	258 (29.7)
Marital status			
Single	233 (54.8)	136 (30.7)	369 (42.5)
Married	192 (45.2)	307 (69.3)	499 (57.5)
Educational status			
Not educated	44 (10.4)	72 (16.3)	116 (13.4)
Educated	381 (89.6)	371 (83.7)	752 (86.6)
Income			
<#30,000	222 (52.2)	276 (62.3)	498 (57.4)
#30,000 - #100,000	181 (42.6)	159 (35.9)	340 (39.2)
>#100,000	22 (5.2)	8 (1.8)	30 (3.5)
Household size			
1 – 3	129 (30.4)	92 (20.8)	221 (25.5)
4 – 6	296 (69.6)	351 (79.2)	647 (74.5)
Occupation			
Employed	326 (76.7)	371 (83.7)	697 (80.3)
Unemployed	99 (23.3)	72 (16.3)	171 (19.7)
Alcohol consumption			
No	321 (75.5)	370 (83.5)	691 (79.6)
Yes	104 (24.5)	73 (16.5)	177 (20.4)
Cigarette smoking			
No	377 (88.7)	422 (95.3)	799 (92.1)
Yes	48 (11.3)	21 (4.7)	69 (7.98)
Body mass index (kg/m^2)			
Normal	319 (75.1)	207 (46.7)	526 (60.6)
Overweight/obese	106 (24.9)	236 (53.3)	342 (39.4)
Physical activity			
< 600 MET-minutes/week	206 (48.5)	226 (51.0)	432 (49.8)
> 600 MET-minutes/week	219 (51.5)	217 (49.0)	436 (50.2)

MET= metabolic equivalent for task

Table 2. Physical activity status of adults stratified by sex

Variables		Physical activity status		
		Inactive	Active	P value
Sex	Male	206 (23.7%)	219 (25.2%)	0.453
	Female	226 (26.0%)	217 (25.0%)	

Physical activity assessment

Table 3 represents the results of univariate and multivariable analysis for the association between sociodemographic and lifestyle factors associated with physical inactivity. In the unadjusted model, age, educational status, household size, marital status and BMI were significantly associated with physical inactivity ($p<0.05$). After adjusting for cofounders, there was a strong association of physical inactivity with increasing age (OR=0.49, 95% CI: 0.34- 0.71), increasing BMI (OR=0.67, 95% CI: 0.49- 0.91), higher income (OR=0.65, 95% CI: 0.48- 0.89), and alcohol consumption (OR=0.67, 95% CI: 0.47- 0.97).

Table 3. Sociodemographic and lifestyle factors associated with physical inactivity

Variables	Univariate analysis OR (95% CI)	P value	Multivariate analysis AOR (95% CI)	P value
Age	2.48 (1.84-3.38)	0.000*	0.49 (0.34- 0.71)	O.000*
Sex	0.90 (0.69- 1.18)	0.453	1.32 (0.97- 1.79)	0.073
Educational status	0.57 (0.38- 0.86)	0.007*	1.25 (0.79- 1.96)	0.339
Income	1.21 (0.58- 2.54)	0.607	0.65 (0.48- 0.89)	0.006*
Household size	1.37 (1.01- 1.87)	0.043*	0.82 (0.60- 1.14)	0.239
Marital status	1.78 (1.36- 2.33)	0.000*	0.91 (0.64- 1.28)	0.574
Occupation	0.80 (0.57- 1.11)	0.178	0.98 (0.67- 1.43)	0.930
Alcohol consumption	1.54 (1.10- 2.15)	0.011*	0.67 (0.47- 0.97)	0.033*
Cigarette smoking	0.96 (0.59-1.57)	0.869	1.09 (0.64- 1.88)	0.733
Body mass index	1.60 (1.22- 2.11)	0.001*	0.67 (0.49- 0.91)	0.010*

*Significant at $p<0.05$, AOR=Adjusted Odds Ratio

physical inactivity levels for countries like Germany (21.1%), Netherlands (22.5%) and Estonia (23.7%).[26] These results negate the notion that the prevalence of physical inactivity is a function of a country's income and is usually high in developed countries and low in less developed and underdeveloped countries.[27] The high prevalence of physical inactivity observed in our study could be attributed to occupations been more sedentary and use of motorised transportation. For instance, our study participants were mostly employed in white collar jobs, which may in turn have reduced their activity levels, since occupational activity is included as a component of daily PA in adulthood as recorded in the GPAQ.[28]

Discussion

In this study, physical inactivity was high among study participants with age, BMI, income and alcohol consumption as associated factors. In addition, a third of the participants was overweight and/or obese.

Consistent with other studies, high prevalence of physical inactivity has been reported among adults in other settings.[11,12] In congruent with our study, a high prevalence of physical inactivity was reported for some high income countries including China (63.1%), Portugal (63.7), Cyprus (44.4%), Singapore (36.5%), Italy (55.6%), Kuwait (67%), Malta (62.8%), Brazil (47%), and Poland (46.1).[24,25,26] On the contrary, studies have reported low

Additionally, urbanization which is associated with sedentary lifestyle and increased weight gain among adults in urban population could also be responsible for the high levels of physical inactivity as observed by Renato Campos Freire.[14] Physical inactivity in this study was higher than reported in studies conducted in Kenya (14.4%), Burkina Faso (7.8%), Malawi (8.4%), Ghana (8.8%), Mexico (19.4%) and Nigeria (32.4%)[16] probably due to differences in lifestyles, study period, setting and methodology.

Age is one of the significant factors associated with physical inactivity in this study as agreed by other authors.[11,29,30,31,43] In this study, we found that middle aged adults had lower odds of been physically inactive compared to younger adults. It is

possible that middle aged adults make conscious efforts to exercise for health benefits since they are at a higher risk of having NCDs.[32] Again, the occupational activities of middle aged adults may be another possible reason. Consistent with our findings, physical activity level was reported to be higher among middle aged/ older adults in both sexes.[11,30] On the contrary, some studies did not find significant associations between physical inactivity and age.[29]

High BMI, which is a known risk factor for NCDs was an important determinant of physical inactivity in this study.[33] The current study revealed that adults with high BMI (overweight or obese) had lower odds of been physically inactive. Consistent with our findings, a study noted that some individuals with obesity engaged in leisure-time physical activity, for more than four hours weekly, reinforcing the importance of knowing the challenges faced by overweight or obese adults so as to plan interventions that target them.[34,35,44] The observed association could also be a reflection of weight management, physical improvement and the release of endorphins, dopamine and adrenaline.[36]

Income is another key determinant of physical inactivity in the present study. Adults in the income category #30,000 - #100,000 had lower odds of been physically inactive compared to those who earn less (< #100,000). A possible explanation for this finding may be attributed to more engagement of middle aged adults in recreational activities which is common among adults in higher income levels.[12] It is also possible that middle aged adults may have additional resources to access and utilize leisure time physical activity opportunities.[37] The finding is however at variance with another study from Ethiopia where adults with high income were more likely to be inactive than those with low income.[38]

Furthermore, the current study also highlights the association between physical inactivity and alcohol consumption. Evidence from studies showed a positive relationship between physical activity and alcohol consumption.[39,40] Choi et al.[40] found that moderate alcohol consumers had higher physical activity levels when compared to non-alcohol consumers. A study by Werneck et al.[41] indicated that daily alcohol consumption is related to higher physical activity among older adults and young women, but with lower physical activity among young and middle-age male adults. Another study, found a dose-response relationship between alcohol consumption and physical activity, indicating that, as drinking increased, physical activity also increases.[42] A plausible explanation could be attributed to the hyperactive nature of alcohol drinkers and socialisation. On the other hand, a study reported that people who smoked cigarettes or drank alcohol were more likely to report physical inactivity than people who do not smoke or drink alcohol.[15] The same study explored gender difference and found that smoking cigarettes and drinking alcohol were significantly associated with physical inactivity level in men but not in women. The reason was attributed to the fact that the proportion of women who smoked cigarettes and drank alcohol was relatively lower than men in their study.[15]

This study has some strengths and limitations. Information on physical activity was self-reported using the GPAQ, and this may have underestimated or overestimated the actual PA of the adults. However, the GPAQ has been validated and recommended for use by the WHO for assessing PA in adults.This study is limited by the cross-sectional nature which does not allow for establishing causal associations, however, the purpose of the study was to investigate associations rather than causality. Also, the sample was drawn from only one geopolitical region out of six in the country, therefore, limiting the generalizability of the findings to other geographical zones. Despite these limitation, our findings serve as a basis for future studies on physical inactivity and associated factors among community dwelling adults in other geopolitical regions of the country.

Conclusion

Physical inactivity was high among the study participants. Age, income, BMI and alcohol consumption were major factors associated with physical inactivity. The findings underscore the need to intensify efforts at promoting and strengthening effective physical activity interventions among community dwelling adults to reduce NCDs

Author's contribution

UPO and UAU conceptualised, designed and read the final draft. UPO, UAU and OBF developed the methodology for coding and statistical analysis. OBF and UPC were involved in structuring and validation of the research questions, data collection and wrote the first draft pf the manuscript. All authors approved the final manuscript and can take public responsibility for its content.

Acknowledgment

The authors would like to thank the research assistants and all the adults from Umuahia North and Ikwuano LGA who participated in the study.

Ethical approval

The Health Research Ethics Committee (HREC) of the Federal Medical Centre, Umuahia (project number: FMC/QEH/G.596/Vol.10/447 and FMC/QEH/G.596/Vol.10/448) granted ethical approval for the study. All participants read and gave informed consent prior to the interview.

Conflict of Interest

Authors declared no conflict of interest regarding this article.

Funding

The author (s) received no financial assistance for the research, authorship and/or publication of this paper

References

1. Kohl HW, Criag CL, Lambert EV, et al. (2012). The pandemic of physical inactivity: Global action for public health. Lancet, 380(9838):294-305. https://pubmed.ncbi.nlm.nih.gov/22818941/
2. Kyu HH, Bachman VF, Alexander LT et al., 2016. Physical activity and risk of breast cancer, colon cancer, diabetes ischemic heart disease and ischemic stroke events BMJ 354:i3857. https://www.bmj.com/content/354/bmj.i3857
3. World Health Organization. Global Status Report on No communicable diseases. Geneva, Switzerland, 2014.
4. Abubakari A, Bhopal R (2008). Systematic review on the prevalence of diabetes, overweight/obesity and physical inactivity in Ghanaians and Nigerians. Public Health, 122(2):173-82. https://pubmed.ncbi.nlm.nih.gov/18035383/
5. Ogah O.S, Madukwe O.O, Onyeonoro U.U, Chukwuonye I.I, Ukegbu A.U, Akhimien M.O, Okpechi I.G (2013). Cardiovascular risk factors and non communicable diseases in Abia State, Nigeria: report of a community-based survey. Intenational Journal of Medicine and Biomedical Research. https://www.ajol.info/index.php/ijmbr/article/view/91937
6. Ding D, Kenny DL, Kolbe-Alexander TL, et al. (2016). The economic burden of physical inactivity: a global analysis of major nob communicable diseases. Physical Activity 2016: progress and Challenge. Lancet, 388(10051):1311–1324. https://pubmed.ncbi.nlm.nih.gov/27475266/
7. Zanchetta LM, Barros MB, Cesar CL, et al. (2010). Physical inactivity and associated factors in adults, Sao Paulo, Brazil. Brazilian Journal of Epidermiology, 13(3); 387-99. https://pubmed.ncbi.nlm.nih.gov/20857026/
8. WHO (2002). The World Health Report 2002: reducing risks, promoting healthy life. World Health Organization. Geneva
9. World Health Organization (2010). Global Recommendations on Physical Activity for Health 2010. http://apps.who.int/iris/bitstream/10665/44399/1/9789241599979_eng.pdf
10. Amin TT, Al-Khoudair AS, Al-Harbi MA, et al. (2012). Leisure time physical activity in Saudi Arabia: Prevalence, pattern and determining factors. Asian Pacific Journal of Cancer Prevention, 13:351-360. https://pubmed.ncbi.nlm.nih.gov/22502700/
11. Ying CY, Kuay LK, Huey TC, et al. (2014). Prevalence and factors associated with physical inactivity among Malaysian adults. Southeast Asian Journal of Tropical

12. Medicine and Public Health, 45(2):467-80. https://pubmed.ncbi.nlm.nih.gov/24968689/
13. Oyeyemi AL, Oyeyemi AY, Jidda Z. A, et al. (2013). Prevalence of physical activity among adults in a Metropolitan Nigerian City: A cross-sectional study. Journal of Epidemiology.23(3):169-177. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3700262/
14. Gaskin C. J. (2018). Factors associated with physical activity and sedentary behaviour in older adults from six low and middle income countries. International Journal of Environmental Research and Public Health, 15:5. doi:10.3390/ ijerph1505090816
15. Renato Campos Freire Junior, DC. (2017). Factors associated with low levels of physical activity among elderly residents in a small urban area in the interior of the Brazilian Amazon. Archives of Gerontolology and Geriatrics, 75:37–43.17. https://pubmed.ncbi.nlm.nih.gov/29180130/
16. Yanfen Z, Jiang W, Zhang S, et al. (2018). Prevalence and risk factors of physical inactivity among middle aged and older Chinese in Shenzhen: a cross sectional study. BMJ Open, 8:10-18. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6194397/
17. Aliyu SU, Chiroma AS, Jajere AM, et al. (2015). Prevalence of physical inactivity, hypertension, obesity and tobacco smoking: A case of NCDs prevention among adults in Maiduguri, Nigeria. American Journal of the Medical Sciences, 3(4):39-47. http://www.sciepub.com/AJMSM/abstract/4816
18. Adeloye D, Ige-Elegbede J O, Auta A, et al. (2021). Epidermiology of physical inactivity in Nigeria: a systematic review and meta-analysis. Journal of Public Health, fdab147. https://pubmed.ncbi.nlm.nih.gov/33982123/
19. Oduwole AA, Ladapo TA, Fajolu IB e al. 2012. Obesity and elevated blood pressure among adolescents in Lagos, Nigeria: a cross sectional study. BMC Public Health 12(1);616. https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-12-616
20. Cochran WG. (1977). Sampling techniques (3rd ed). New York. John Wiley & Sons.
21. National population commission (NPC) (2006). The Population Census of the Federal Republic of Nigeria Analytical report at the National Population Commission, Abuja.
22. Marfell-Jones MJ, SA, De Ridder J. (2012). International standards for anthropometric assessment.
23. WHO. (2000). Obesity: preventing and managing the global epidemic. World Health Organization; 2000.
24. World Health Organization (2008). Global Physical Activity Questionnaire (GPAQ) Instrument v2. WHO Press. Geneva, Switzerland; 2008.
25. Zhou Y, Wu J, Zhang S, et al (2018). Prevalence and risk factors of physical inactivity among middle-aged and older Chinese in Shenzhen: a cross-sectional study BMJ Open 2018;8:e019775. https://bmjopen.bmj.com/content/8/10/e019775
26. Guthold R, Ono T, Strong KL, Chatterji S, Morabia A. (2008). Worldwide variability in physical inactivity: a 51-country survey. Am J Prev Med. 2008;34(6):486–94. https://pubmed.ncbi.nlm.nih.gov/18471584/
27. Katerina, N., Satomi, O., Nektarios, D.,, George, R.,, Emmanouil, S.,, Constantine, V. (2021). Prevalence and correlates of physical inactivity in adults across 28 European countries, European Journal of Public Health, Volume 31, (4): 840–845. https://academic.oup.com/eurpub/article-abstract/31/4/840/6277121
28. Hosseinpoor AR, Bergen N, Kunst A, Harper S, Guthold R, Rekve D, d'Espaignet ET, Naidoo N, Chatterji S. (2012). Socioeconomic inequalities in risk factors for non-communicable diseases in low-income and middle-income countries: results from the world health survey. BMC Public Health. 2012;12(1):912. https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-12-912
29. Salmon J, Owen N, Bauman A, et al. (2000). Leisure-time, occupational and household physical activity among professional, skilled, and less-skilled workers and homemakers. Journal of Preventive Medicine 30(3):191-199. https://pubmed.ncbi.nlm.nih.gov/10684742/
30. Gal DL, Santos AC, Barros H. (2005). Leisure-time versus full-day energy expenditure: a cross-sectional study of sedentarism in a Portuguese urban population. BMC Public Health, 5:16. https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-5-16
31. Centre for Disease Control and Prevention (CDC) (2003) Prevalence of physical activity including lifestyle activities among adults—United States, 2000–2001. Morbidity Mortality Weekly Report, MMWR, 52:764–9. https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5232a2.htm
32. Centers for Disease Control and Prevention (CDC) (2004). Framework for evaluating public health surveillance: systems for early detection of outbreaks: recommendations from the CDC working group. MMWR. 2004;53(RR5):1–14.
33. Umstattd MR, Wilcox S, Saunders R, et al. (2008). Self-regulation and physical activity: the relationship in older adults. American Journal of Health Behavior. 32(2)115-24. https://psycnet.apa.org/record/2008-03312-001
34. Church T.S, Cheng YJ, Earnest CP, et al. (2004). Composition and predictors of mortality among men. Diabetes Care, 27(1)83-88. https://pubmed.ncbi.nlm.nih.gov/14693971/
35. Linder S, Abu-Omar K, Geidl W, Messing S, Sarshar M, et al. (2021) Physical inactivity in healthy, obese, and diabetic adults in Germany: An analysis of related socio-demographic variables. PLOS ONE 16(2):

36. e0246634. https://doi.org/10.1371/journal.pone.0246634
37. Catania JA, Dolcini MM, Sallis JF, et al. (2002). A commentary on sallies, Owen and Fortheringham's perspective on "bevioural epidermiology: A systematic framework to classify phases of research on health promotion and disease prevention". Annals of Behavioral Medicine, 24. https://pubmed.ncbi.nlm.nih.gov/12054322/
38. An HY, Chen W, Wang C, et al. (2020). The Relationships between Physical Activity and Life Satisfaction and Happiness among Young, Middle-Aged, and Older Adults. International Journal of Environmental Research and Public Health, 17(13), 4817. https://doi.org/10.3390/ijerph17134817
39. Abdeta C, Teklemariam Z, Seyoum, B. (2018). Prevalence of physical inactivity and associated factors among adults in Harar town, Eastern Ethiopia. Baltic Journal of Health and Physical activity 10(2);72-80. http://files.4medicine.pl/download.php?cfs_id=2747
40. Dodge T, Clarke P. (2018). Testing weight motives and guilt/shame as mediatos of the relationship between alcohol use and physical activity. Addictive Behavios. 77:131-6. https://psycnet.apa.org/record/2017-52967-023
41. Buscemi J, Martens MP, Murpht J. G, et al. (2011). Moderators of the relationship between physical activity and alcohol consumption in college students. Journal of American College Health, 59:503-9. https://pubmed.ncbi.nlm.nih.gov/21660805/
42. Choi B, Schnall P, Yang H, et al. (2010). Psychosocial working conditions and active leisure-time physical activity in middle-aged us workers. International Journal of Occupational Medicine and Environmental Health. 23:239-53. https://psycnet.apa.org/record/2011-05089-003
43. Werneck AO, Oyeyemi AL, Szwarcwald CL, et al. (2019). Association between physical activity and alcohol consumption: sociodemographc and behavioural patterns in Brazilian adults. Journal of Public Health, 41 (4):781-787. https://pubmed.ncbi.nlm.nih.gov/30445471/
44. Piazza-Gardner AK, Barry A. (2012). Examining activity levels and alcohol consumption: Are people who drink more active? American Journal of Health Promotion, 26(3);e95-104. https://pubmed.ncbi.nlm.nih.gov/22208422/
45. Al-Tannir M, Kobrosly S, Itani T, El-Rajab M, et al. (2009). Prevalence of physical activity among Lebanese Adults: A crosssectional study. Journal of Physical Activity Health. 2009;6:315–20. https://pubmed.ncbi.nlm.nih.gov/19564659/
46. Barry VW, Baruth M, Beets MW, et al. (2014). Fitness vs. fatness on all-cause mortality: a meta-analysis. Prog Cardiovascular Disease ;56(4):382–90. pmid:24438729. https://pubmed.ncbi.nlm.nih.gov/24438729/